Error Envelopes for MISR Level 2 Aerosol Optical Depths at Stage 2 Validated Quality Level

Error envelopes for the MISR aerosol optical depth product have been determined based on results of a research study which compared aerosol optical depths (AODs) from MISR with those from AERONET. The data below were obtained from the paper "MISR Global Aerosol Optical Depth Validation Based on Two Years of Coincident AERONET Observations," by Ralph A. Kahn et. al., submitted to The Journal of Geophysical Research, Atmospheres, in February 2004. In the study, AERONET measurements were interpolated to MISR wavelengths and averaged over a window surrounding the MISR overpass time. Comparisons from two years of data (December 2000 through November 2002) were included. Complete details of the study can be found in that paper.

A summary of the the study results presented in Table 1 shows that overall, 63% of MISR and AERONET AODs in the green band were within 0.05 or 20% of each other, and 40% were within 0.03 or 10% of each other. Table 1 reports the full results, sorted according to aerosol air mass type.

Table 1: MISR-AERONET AOD Comparison Statistics by Aerosol Type

Spectral Band	MISR Mean AOD[a]	Mean AOD difference (%)[b]	Standard Deviation of AOD differences[c]	% within 0.05 or 20% (green band only)	% within 0.03 or 10% (green band only)
Biomass burning *(135 cases)*					
blue	0.310	28	0.081		
green	0.246	32	0.071	66	39
red	0.201	38	0.064		
near-infrared	0.152	45	0.058		
Continental *(247 cases)*					
blue	0.206	52	0.089		
green	0.154	54	0.076	63	42
red	0.121	68	0.066		
near-infrared	0.088	70	0.055		
Dusty *(132 cases)*					
blue	0.285	46	0.107		
green	0.228	52	0.104	55	37
red	0.187	62	0.098		

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Spectral Band	MISR Mean AOD[a]	Mean AOD difference (%)[b]	Standard Deviation of AOD differences[c]	% within 0.05 or 20% (green band only)	% within 0.03 or 10% (green band only)
near-infrared	0.142	108	0.079		
Maritime *(65 cases)*					
blue	0.177	73	0.059		
green	0.137	47	0.038	69	45
red	0.108	40	0.031		
near-infrared	0.076	34	0.021		

a. Computed as the average optical depth of all aerosol mixtures which yielded a successful optical depth retrieval for a 17.6 km^2 region. (Grid field ***RegMeanSpectralOptDepth*** in the Level 2 aerosol product.)

b. The Mean AOD difference is the average value of abs[(MISR-AERONET)/AERONET], expressed as a percent, where MISR and AERONET are AOD evaluated in each MISR spectral band. A single event, for which the AERONET AOD is extremely low, is responsible for the high Mean AOD Difference value of 108% for the Central Dusty near-infrared spectral band. Eliminating this event reduces the value to 84%.

c. Events having AOD higher than 0.5 are rare in this data set. The standard deviation of MISR-AERONET AOD differences are calculated only over cases having $AOD_{MISR} < 0.5$, to avoid skewing this statistic with individual extreme outliers.